Message Text

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14
ACTION EUR-12

INFO OCT-01 EA-07 ISO-00 FEA-01 AID-05 CEA-01 CIAE-00

CIEP-01 COME-00 DODE-00 EB-07 FPC-01 H-02 INR-07

INT-05 L-03 NSAE-00 NSC-05 OMB-01 PM-04 USIA-06

SAM-01 OES-03 SP-02 SS-15 STR-04 TRSE-00 /094 W
---------- 097276
R 111707Z MAR 76
FM USMISSION EC BRUSSELS
TO SECSTATE WASHDC 729
INFO ALL EC CAPITALS 1819
ERDA WASHDC
IAEA VIENNA 1955

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ERDA PASS SIEVERING, AIA AND R. HIRSCH, ASGA

E.O. 11652: N/A
TAGS: TECH
SUBJECT: SOME CLARIFICATION ON THE CURRENT "JET" SITUATION

REF: EC BRUSSELS 01914

1. THE INABILITY OF THE EUROPEAN COMMUNITIES COUNCIL OF MINISTERS TO REACH AGREEMENT ON THE OVERALL JET THERMONUCLEAR PROGRAM HAS BEEN REPORTED IN THE REFTEL AND ON NUMEROUS OCCASIONS IN THE EUROPEAN PRESS. IN ADDITION, IT IS REPORTED EUROPE IS LOSING ITS "LEAD" IN THERMONUCLEAR RESEARCH AS A RESULT OF THESE ACTIONS. THE FOLLOWING

MAY PROVE USEFUL AS BACKGROUND FOR THESE AND OTHER STATEMENTS WHICH CAN BE EXPECTED IN THE ENSUING MONTHS REGARDING THE EUROPEAN COMMUNITY'S THERMONUCLEAR PROGRAM.

2. THE EC JOINT EUROPEAN TORUS (JET) REPRESENTS A MAJOR COMMUNITY REASEARCH EFFORT IN THE APPROXIMATELY 80 PERCENT OF THE JET
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EXPERIMENTAL FINANCIAL SUPPORT WILL BE BORN BY THE EUROPEAN

COMMISSION. THE JET DESIGN TEAM HAS BEEN IN EXISTENCE SINCE
SEPTEMBER
1973, AND A FINAL DESIGN PROPOSAL (EUR-JET-R5) HAS RECENTLY BEEN
ISSUED. THE INTENTION IS TO HAVE BY 1980 A RESEARCH PROJECT
OF MAJOR FUSION REACTOR SIGNIFICANCE. IN THE SAME TIME FRAME,
THERE ARE ALSO COMPARABLE LARGE PROJECTS PLANNED IN THE U.S. (TFTR),
JAPAN (JT-60), AND THE USSR (T-20). THESE SERIES OF LARGE
TOKAMAKS WILL FORM AN IMPORTANT LINK IN THE ROAD TO A RUSION
POWER REACTOR VIA THEIR INCREASED LINEAR DIMENSIONS, MAGNETIC
FIELDS, AND POWER CAPABILITIES, BUT ONE PROBABLY CANNOT YET STATE
THAT PROGRESS BY ANY ONE PROJECT IS AHEAD. THERE STILL ARE TOO
MANY UNCERTAINTIES IN THE CRITICAL PARAMETERS WHICH EFFECT THE
REQUIRED COMBINATION OF PLASMA DENSITY, TEMPERATURE AND BURN TIME.

3. REQUIRED PLASMA CONDITIONS MAY ROUGHLY BE DEFINED AS THE
SIMULTANEOUS ACHIEVEMENT OF TEMPERATURES GREATER THAN 100 MILLION
DEGREES AND A CONFINEMENT PARAMETER OF GREATER THAN 10 RAISED
TO THE 14TH POWER WHERE CONFINEMENT PARAMETER IS THE PRODUCT
OF PLASMA DENSITY (PARTICLES/PER CUBIC CENTIMETER) AND
TIME OF BURN (SECONDS). TO DATE THE SIMULTANEOUS ACHIEVEMENT OF
THESE MINIMUM CRITERIA HAS NOT OCCURRED, ALTHOUGH SEPARATELY,
MAGNETIC CONFINEMENT DEVICES HAVE ACHIEVED UP TO 100 MILLION DEGREES,
AND A CONFINEMENT PARAMETER OF ABOUT 5 X 10 TO THE 13TH POWER --
THE LATTER OCCURRING RECENTLY AT THE MIT ALCATOR EXPERIMENT IN
THE U.S. (HOWEVER, ALCATOR, TEMPERATURES ONLY OF ABOUT 10 MILLION
DEGREES WERE ACHIEVED.) ASIDE FROM THE MINIMUM "PHYSICS" CRITERIA
MENTIONED ABOVE FOR FUSION CONDITIONS TO EXIST, THERE ARE ALSO
MAJOR ENGINEERING ORIENTED CONSIDERATIONS THAT DIFFER IN THE NEXT
AND OTHER GENERATIONS OF MACHINES FROM THOSE OF TODAY'S EXPERIMENTS.
THESE INCLUDE, BUT ARE NOT LIMITED TO: (A) THE ENGINEERING METHOD
FOR EXTRACTION OF
THE FUSION RELASED ENERGY, ONCE IT IS PRODUCED IN SIGNIFICANT
QUANTITY, (B) THE TIME OVER WHICH THE ENERGY IS PRODUCED (BURNTIME)-
TODAY LESS THAN ONE TENTH OF A SECOND, AND PLANNED IN JET AND
OTHER FUTURE DEVICES TO BE GREATER THAN TEN SECONDS, (B) WHETHER
THE METHOD OF OBTAINING THE REQUIRED CONFINING MAGENTIC FIELD CAN
BE DERIVED FROM SUPERCONDUCTING TECHNIQUES TO SIGNIFICANTLY REDUCE
THE REQUIRED POWER INPUT AND (D) THE METHODS FOR PERMITING MAIN-
TENANCE AND TIMELY REMOVAL OF INTERNAL PARTS WHOSE LIFETIMES
MAY BE SIGNIFICANTLY LESS THAN THOSE OF THE POWER PLANTS.
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4. THE FOLLOWING BACKGROUND ON THE FINANCIAL SITUATION OF THE JET
PROGRAM MAY BE OF VALUE: AS PART OF A SET OF NEW MULTIANNUAL
RESEARCH PROGRAM PROPOSALS TO THE EC COUNCIL IN JULY 1975, THE
FIELD RECEIVING THE LARGEST RECOMMENDED ALLOCATION, ON THE GROUNDS
THAT IT HELD PROSPECTS FOR A NEW SOURCE OF PLENTIFUL AND NON-
POLLUTANT ENERGY, WAS CONTROLLED THERMONUCLEAR FUSION AND PLASMA
PHYSICS --265 MILLION UNITS OF ACCOUNT (MUA) OUT OF A 335 MUA

TOTAL FOUR-YEAR RECOMMENDED BUDGET. OF THE 265 MUA, THE COMMISSION WOULD PROVIDE 108 MUA OF THE 135 MUA REQUIRED ROR CONSTRUCTION OF THE JET DEVICE. (ONE UNIT OF ACCOUNT IS CURRENTLY APPROXIMATELY 1.14 US DOLLARS.) THE 135 MUA MAY BE ROUGHLY SUBDIVIDED AS FOLLOWS: 67.6 HARDWARE; 15.3 BUILDINGS; 31.9 MANPOWER AND OVERHEAD; 8.9 OPERATING; AND 11.3 CONTINGENCY. TO PROCEED ON SCHEDULE FOR A 1980 STARTUP, ROUGHLY 14 MUA APPEARS NEEDED TO BE SPENT IN CY-9176.

5. THE CURRENT SITUATION ON JET IS THAT THE COUNCIL OF THE EUROPEAN COMMUNITY HAS APPROVED EXPENDITURES FOR THE FUSION PROGRAM IN GENERAL (124 MUA FOR FIVE YEARS - 20.8 MUA PERMISSABLE EXPENDITURE IN THIS YEAR). WHAT IS STILL UNREASOLVED IS WHETHER LONG LEAD JET ITEMS MAY BE ORDERED WITHIN APPROVED FUNDING (ABOUT 15 MUA WOULD BE NEEDED TO MAINTAIN PROJECTED SCHEDULES).

6. COMMENT: IT APPEARS THAT THE CURRENT ISSUE ON JET SOLEY HINGES ON THE POLITICS OF ACHIEVING AN AGREED-UPON SITE. BOTH THE U.K. AND ITALY ARE INSISTING STRONGLY ON THEIR OWN LOCATIONS (CULHAM IN THE U.K. AND ISPRA IN ITALY). THE U.K.'S MAIN ARGUMENT IS THAT THEIRS IS THE LOGICAL SITE AS THE ENTIRE DESIGN TEAM IS CURRENTLY LOCATED AT THE CULHAM SITE AND THE INSTALLATION HAS PRIOR EXPERIENCE IN FUSHION RESEARCH. HOWEVER, IT APPEARS RECENT U.K. INSISTENCE OF NOT SUPPORTING THE OECD-EC DRAGON HIGH TEMPERATURE GAS REACTOR PROJECT SITED AT WINFRITH (AN APPROXIMATELY $8 MILLION PER YEAR PROJECT) MAY BE CASTINGDOUBTS IN OTHER EC PARTNERS FOR PLACING THE JET PROJECT IN THE U.K. ITALY ALSO IS LOBBYING HEAVILY FOR THE JET PROJECT, TO THE POINT OF REFUSING TO APPROVE OVERALL PROJECT FUNDING UNLESS THE ISPRA SITE IS APPROVED. WAITING IN THE WINGS ARE BOTH FRANCE AND GERMANY, BOTH WITH SEVERAL HIGHLY QUALIFIED SITING POSSIBILITIES.

7. THE ROAD TO THE ACHIEVEMENT OF A USEFUL, RELIABLE, CLEAN ENERGY CONTRIBUTING SOURCE FOM THERMONUCLEAR FUSION IS STILL LONG,
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BUT RESEARCHERS ARE HOPEFUL THAT THE NEXT GENERATIONS OF MACHINES INCLUDING THE JET, WILL BE ABLE TO EXCEED THE MINIMUM CONDITIONS NOTED, AND LEAD THE WAY TO VIABLE NET POWER PRODUCING FUSION PLANTS. END COMMENT. HINTON

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Message Attributes

Automatic Decaptioning: X
Capture Date: 01 JAN 1994
Channel Indicators: n/a
Current Classification: UNCLASSIFIED
Concepts: SCIENTIFIC COOPERATION, NUCLEAR RESEARCH, NUCLEAR REACTORS, FINANCIAL CONTRIBUTIONS
Control Number: n/a
Copy: SINGLE
Draft Date: 11 MAR 1976
Decaption Date: 01 JAN 1960
Decaption Note:
Disposition Action: RELEASED
Disposition Approved on Date:
Disposition Authority: GolinoFR
Disposition Case Number: n/a
Disposition Comment: 25 YEAR REVIEW
Disposition Date: 28 MAY 2004
Disposition Event:
Disposition History: n/a
Disposition Reason:
Disposition Remarks:
Document Number: 1976ECBRU02479
Document Source: CORE
Document Unique ID: 00
Drafter: n/a
Enclosure: n/a
Executive Order: N/A
Errors: N/A
Film Number: D760093-0973
From: EC BRUSSELS
Handling Restrictions: n/a
Image Path:
ISecure: 1
Legacy Key: link1976/newtext/t19760372/aaaaclno.tel
Line Count: 158
Locator: TEXT ON-LINE, ON MICROFILM
Office: ACTION EUR
Original Classification: LIMITED OFFICIAL USE
Original Handling Restrictions: n/a
Original Previous Classification: n/a
Original Previous Handling Restrictions: n/a
Page Count: 3
Previous Channel Indicators: n/a
Previous Classification: LIMITED OFFICIAL USE
Previous Handling Restrictions: n/a
Reference: 76 EC BRUSSELS 1914
Review Action: RELEASED, APPROVED
Review Authority: GolinoFR
Review Comment: n/a
Review Content Flags:
Review Date: 29 MAR 2004
Review Event:
Review Exemptions: n/a
Review History: RELEASED <29 MAR 2004 by ShawDG>; APPROVED <30 MAR 2004 by GolinoFR>
Review Markings:

Margaret P. Grafeld
Declassified/Released
US Department of State
EO Systematic Review
04 MAY 2006

Review Media Identifier:
Review Referrals: n/a
Review Release Date: n/a
Review Release Event: n/a
Review Transfer Date:
Review Withdrawn Fields: n/a
Secure: OPEN
Status: NATIVE
Subject: SOME CLARIFICATION ON THE CURRENT "JET" SITUATION
TAGS: TECH, XG, JET, JOINT EUROPEAN TORUS
To: STATE
Type: TE
Markings: Margaret P. Grafeld Declassified/Released US Department of State EO Systematic Review 04 MAY 2006